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THE KNOWN MOLLUSCA OF SAN BERNARDINO COUNTY, CALIFORNIA.

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In light of the fact that accurate data bearing on the geographical distribution of Californian land and fresh-water mollusca are still few and far between, it seems best to publish such items as may be accumulated from time to time, and in this connection the following notes (the result of several years desultory observation) may be of interest.

The district under present consideration comprises one of the largest, if not the largest, counties in the United States, being more than equal in area to any one of a number of our smaller States. By far the greater portion of its area is swallowed up by the vast Mojave and Colorado Deserts, and even at this late date is still almost an absolute terra incognita so far as the mollusca are concerned. Of necessity, therefore, the present paper treats almost exclusively of the extreme southwestern corner of the county alone, namely, the so-called San Bernardino Valley, with the adjacent San Gabriel and San Bernardino Ranges of mountains which confine it on the north and shut it off from the desert and the remainder of the county. Even for this circumscribed district, the present list makes no pretensions to completeness, but is offered merely as a résumé of our present knowledge, with the hope that it may lead to further investigation. Doubtless more than one interesting form still awaits its discovery by some diligent collector, especially in the mountain regions (see Nautilus XXI, p. 121, and below).

It is interesting to note that the above-mentioned valley is practi-

cally the only portion of the entire county which drains directly into the Pacific, and that, thanks to the fertile character of its soil and the water available for its irrigation from the neighboring mountains, almost the whole population of the county is concentrated here, notably in the cities of Redlands, San Bernardino, Ontario, Chino, and Colton. All are garden spots, and by the unwitting agency of man most of them have come to possess a fairly extensive molluscan fauna, many species of alien origin being now far more numerous than any of the native forms.

There have been few previous records for any of the localities of the region. Binney ['85] gives one or two species as being found in the county, but at least one of his records is without doubt erroneous. Stearns ['93] is the next author to report on specimens from our area, and his records are about all we have from the great desert region. The few records since that time are listed at the end of this paper.

My thanks are due to Dr. R. H. Tremper, of Ontario, who has generously supplied me with numerous specimens and data regarding the fauna of his immediate neighborhood. Practically all of his records are new and very interesting. I am also under obligations to Miss Nina G. Spaulding, of Redlands, whose enthusiastic efforts have aided not a little in increasing our knowledge. Data supplied through her or through Dr. Tremper are so noted by the use of their initials. I am also indebted to Mr. Sanford B. Dole, of Riverside, for the use of the accompanying photograph.

List of Species.

Helix aspersa Müller. Occasional around greenhouses at Redlands, but evidently not yet thoroughly at home.

Epiphragmophora traski (Newcomb). "Under dry leaves in small foothill cañon near Ontario" [R. H. T.]; also in San Antonio Cañon, two miles from mouth, elevation 2500 feet [R. H. T., April 4, 1908]; under leaves, Stoddard's Cañon, elevation 2500 feet [R. H. T., 1909].

This coast species apparently just enters the county as I have not encountered it even in the upper end of the San Bernardino Valley.

Epiphragmophora tudiculata (W. G. Binney). Mentone, under hedges; Highland, by the roadside after a rain; Arrowhead, Hot Springs; San Bernardino and vicinity; greenhouse in same city [R. H. T.]; Ontario, under stones and woodpiles [R. H. T., 1908–

1909]; also southeast of Ontario, some seven miles from the foothills [R. H. T., March, 1909]; Frankish Cañon, under stones, altitude 2500 feet [R. H. T., April 1, 1908]; at mouth of Stoddard's Cañon, at same elevation, under stones [R. H. T., 1909].

Specimens found by Dr. Tremper in January, 1908, in an orange grove at Ontario are particularly beautiful examples of the species, some showing a curious tendency toward albinism.

Vallonia pulchella (Müller). Redlands, common in greenhouses [S. S. B., 1903, '04, '06, '08].

Vertigo occidentalis Sterki. Bluff Lake, altitude 7,550 feet, 1907 (one specimen only) [S. S. B.]; in 1908 quite common in *spots* in the big Bluff Lake cienaga, in the cienaga just north, and along the "New England Trail," altitude 7,500 feet; also a few specimens in a cienaga west of Green Valley, altitude 6,900 feet [S. S. B.]. Many more specimens were sent from Bluff Lake during the present summer by Miss N. G. Spaulding.

Evidently an abundant species in the more Alpine regions of the San Bernardino Mountains, and I suspect that this or a closely allied form will also turn up in similar localities in the neighboring San Gabriel and San Jacinto Ranges.

Vertigo sp. Another form occurs with *V. occidentalis* in the neighborhood of Bluff Lake [S. S. B., Aug., 1908; N. G. S., Aug., 1909].

Vertigo rowelli (Newcomb). San Bernardino [Binney, '85, p. 156]. At best a doubtful record.

Vitrina alaskana Dall. San Bernardino Mountains—a common species at Bluff Lake and vicinity [S. S. B., Aug., 1907, Aug., 1908; N. G. S., Aug., 1909]; cienaga west of Green Valley [S. S. B., July, 1908]. Especially abundant under *willow* trees at the edges of a meadow.

Vitrea cellaria (Müller). In greenhouses, Redlands [S. S. B., 1904–'08].

Euconulus fulvus (Müller). Cienaga west of Green Valley [one specimen, S. S. B., July, 1908]. Altitude 6,900 feet. Bluff Lake Meadow (altitude 7,550 feet) and the neighboring cienages [S. S. B., Aug., 1907, Aug., 1908 (abundant); N. G. S., Aug., 1909 (abundant)]. Near mouth of Mill Creek Cañon [one specimen in drift, S. S. B., July, 1908]. Forest Home, altitude 5,200 feet, a colony of about 20 live individuals found by the writer under sticks on the bank of Mill Creek, June 12, 1909.

"San Gorgonio Pass" [Binney, '85, p. 68]. The exact locality of Binney's specimens is doubtful, but not of great importance as this is evidently a common mountain species, occurring throughout the San Bernardino Range. I have as yet seen no specimens from the San Gabriels.

Zonitoides orea (Say). Mouth of Stoddard's Cañon, near Ontario, under leaves [R. H. T., 1909]. Redlands, in greenhouses [S. S. B., 1904–1908]. Bluff Lake [S. S. B., 1907]; Bluff Lake and cienaga just north [S. S. B., Aug., 1908—ten specimens]; several specimens, same locality [N. G. S., Aug., 1909].

Zonitoides milium (Morse). Greenhouse, Redlands, one specimen [S. S. B., 1904].

Zonitoides minuscula (Binney). Greenhouse, Redlands [S. S. B., 1904].

Limax maximus Linnaeus. Redlands, in greenhouses in 1904 [S. S. B.]; now abundant about houses and in yards everywhere. Reported from same locality by Bartsch ['04, p. 12].

Ontario [R. H. T., 1908, 1909]. The last specimens sent me by Dr. Tremper were the most light-colored of the species I have seen in California.

Limax flavus Linnaeus. Redlands, with *L. maximus* [S. S. B., 1904].

Pyramidula cronkhitei (Newcomb). Cienaga, north of Bluff Lake Meadow, San Bernardino Mountains, altitude 7,500 feet [S. S. B., 16 specimens, Aug., 1908; N. G. S., Aug., 1909, abundant].

Punctum californicum Pilsbry. Occasional in Bluff Lake Meadow under sticks [S. S. B., Aug., 1908]; Cienaga, north of Bluff Lake, altitude 7,500 feet, not rare [S. S. B., Aug., 1908; N. G. S., Aug., 1909]. Being in doubt as to whether these specimens were correctly referred to this species, examples were sent to Mr. Bryant Walker, who confirmed the identification.

Punctum conspectum (Bland). Near Green Valley, San Bernardino Mountains, altitude 6,900 feet, 3 specimens [S. S. B., July, 1908]; Bluff Lake, one specimen [S. S. B., Aug., 1908].

Succinea oregonensis Lea. Lower end of the big Cienaga at Bluff Lake along the "New England Trail," 18 specimens [S. S. B., Aug., 1908] 13 specimens [N. G. S., Aug., 1909].

Lymnæa palustris (Müller). Bear Lake, altitude 6,700 feet, San Bernardino Mountains, abundant [S. S. B., 1907, 1908].

Lymnæa palustris nuttalliana (Lea). Creek and swamp at Bluff Lake, altitude 7,550 feet, abundant [R. D. Williams, 1905; S. S. B., 1907, 1908; N. G. S., 1909]. These specimens very uniform in appearance. Bear Lake, intergrading with typical (?) palustris, common [R. H. T., Aug., 1902; S. S. B., Aug., 1907, 1908].

Lymnæa humilis modicella (Say). On flower pots in greenhouses, Redlands, abundant [S. S. B., 1904–'08].

Lymnæa caperata Say. A single very juvenile specimen collected by Dr. Tremper in a pool in San Antonio Creek, 2 miles from mouth [April 4, 1908], was identified as this species by Mr. F. C. Baker.

Lymnæa bulimoides Lea. Mojave River, near Daggett [Stearns, '93].

Physa gyrina (Say) ? Redlands, in irrigating ditches; Garlick Springs [Stearns, '93]; Daggett [Stearns, '93].

I suspect that most if not all the Southern California records of *P. gyrina* need re-examination, and the above will more than likely prove to be varieties of *P. virginea* Gould.

Physa lordi Baird. Artificial pond, Ontario, the water of which comes from Hermosa Cañon [R. H. T.]. Specimens of this fine large species were sent to Mr. F. C. Baker, who agrees with me in referring them to *P. lordi*.

Physa virginea Gould. Ditches and reservoirs in Redlands, common [S. S. B., 1907, 1908].

Physa virginea traski Lea. Main irrigating ditch of Ontario, near mouth of San Antonio Cañon, altitude 2,200 feet [R. H. T.].

Physa cooperi Tryon. Watering trough in City Creek Cañon, San Bernardino Mountains [S. S. B., Aug., 1907, July, 1908]; Bear Lake, altitude 6,700 feet [S. S. B., Aug., 1907–'08].

Physa politissima Tryon. Bear Lake, altitude 6,700 feet, not uncommon [S. S. B., 1907, 1908].

Dr. Pilsbry, to whom I sent specimens of this and the preceding species, and to whom I owe their determinations, wrote as follows: "It should be said that the synonymy of West Coast Physas has never been worked up, and the ultimate names which will be used cannot now be decided, but your specimens correspond closely to the *type lots* of the forms mentioned, whether these be species or varieties."

Planorbis trivolvis Say. England's Park, Redlands; swamp and creek at Bluff Lake [S. S. B., 1907, 1908; R. D. Williams,

1905]; Bear Lake [R. H. T., 1902; S. S. B., 1907, 1908]; Daggett [Stearns, '93].

Planorbis parvus Say. Mojave River, near Daggett [Stearns, '93]; Swamp at Bluff Lake [S. S. B., 1907, 1908]; Bear Lake [S. S. B., 1907, 1908].

The specimens from Bear Lake were identified by Dr. Dall as *P. vermicularis* Gould. They certainly have a slightly different aspect from the Bluff Lake specimens, but I doubt if they are distinct.

Paludestrina stearnsiana Pilsbry. Rill near mouth of Mill Creek Cañon, San Bernardino Mountains, very abundant in July, 1908 [S. S. B.], but a rather hasty search in the same locality one year later did not yield a specimen.

Mountain Home Creek, San Bernardino Mountains, altitude 3,600 feet [S. S. B., July 11, 1909].

[*Paludestrina protea* Gould. In numerous collections I have seen large series of this species in a subfossil condition which were distributed some years ago by an unknown collector as from the "Mojave Desert." They are probably from San Bernardino County, so I record them here, although "Colorado Desert" may have been what the label meant. As the species is known to exist in Inyo and Riverside Counties, it may reasonably be expected to turn up in the living condition in this county as well.]

[*Valvata lewisii* Currier. San Bernardino Mountains, Cal. [fide Dall, '05, p. 123; also see Walker, '06, p. 26].

I have not seen any of Dall's specimens, but I have no doubt whatever that they really represent not *V. lewisii*, but the following form:]

Valvata humeralis californica Pilsbry. Swamp at Bluff Lake, altitude 7,550 feet [S. S. B., Aug., 1907, 1908; N. G. S., Aug., 1909—not very abundant].

Bear Lake, altitude 6,700 feet, the type locality [S. S. B., Aug., 1907, 1908].

For this form beside the references given above under *V. lewisii*, see Berry, '08, p. 122, and Pilsbry, '08, p. 82.

Anodonta californiensis (Lea) var. Chino Creek. S. of Ontario [R. H. T., 1908].

Musculium raymondi (J. G. Cooper). Swamp and creek at Bluff Lake, large and abundant in 1905 [R. D. Williams]; very common but small in 1907 [S. S. B.]; more rare in 1908 [S. S. B.] and 1909 [N. G. S.]; apparently being replaced by the following species.

Pisidium californicum (Newcomb ?). Swamp and creek at Bluff Lake, common in 1907 [S. S. B.], abundant in 1908 [S. S. B.], and 1909 [N. G. S.].

Pisidium ashmuni Sterki. Swamp at Bluff Lake [S. S. B., 1907]. Identified by Dr. Sterki.

Specimens of *Pisidia* have also been found in Kid Creek, San Bernardino Mountains [N. G. S., Aug., 1909], and in Mill Creek at Forest Home, altitude 5,200 feet [S. S. B., July, 1908], but have not as yet been determined by Dr. Sterki.

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